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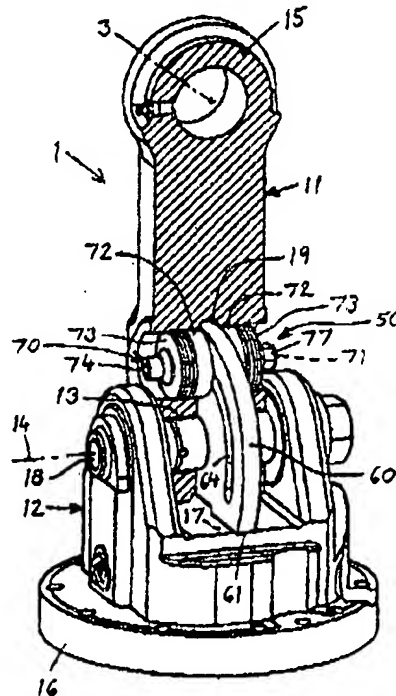
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(54) Title: ARRANGEMENT AND METHOD RELATING TO A SWING DAMPER

(57) Abstract

An arrangement relating to a swing damper, particularly a swing damper (1) for carrying a tool (5) that hangs from a crane jib (2) or the like. The swing damper (1) has an upper part (11) that is connected to the crane jib (2), and a lower part (12) that is connected to a work tool (5) or some similar device, either directly or via a rotor (4) for instance. The upper part (11) and the lower part (12) are pivotally interconnected via a slewing joint (13). A brake arrangement (50) included in the swing damper (1) comprises at least one brake disc (60) and at least one brake unit (70) that coacts with said disc. The brake disc (60) is either carried by the upper part (11) or the lower part (12) of the swing damper, whereas the brake unit (70) is carried by that part which does not carry the brake disc. The brake disc (60) includes a slot (64) through which a brake unit fastener device (71) extends. The brake unit (70) includes at least two brake components (72), each being placed on a respective side of the brake disc (60). The brake components (72) are pressed into braking abutment with the brake disc (60), by means of spring devices (73) or by a pressure medium adapted to act between the fastener device (71) and the brake components (72). The invention also relates to a method.



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ARRANGEMENT AND METHOD RELATING TO A SWING DAMPER

The present invention relates to an arrangement pertaining to a swing damper of the kind defined in the preamble of Claim 1.

5 The invention also relates to a method.

In connection with the use of swing dampers to support different type of tools, for instance tools that hang from a crane jib or arm, it is desired to be able to dampen or brake
10 the pendulum movement/oscillating movement that normally occurs when maneuvering the crane jib and performing various tasks in both an effective and reliable manner.

Swing dampers can be used in connection with all conceivable types of tool that, e.g., hang from the tip of a crane jib, for instance tools used in such machines as forest harvesters, scotters, forest processors, lumber cranes, excavators and diggers, special duty machines, etc. The swing damper may have
15 a single or a double function, in other words it may function to dampen/brake a swinging mass in one or two pendulating planes/oscillating planes.
20

One object of the present invention is to provide a swing damper that includes a highly advantageous brake arrangement, and also to provide a braking process. These objects are
25 achieved with an arrangement and a method that have the characteristic features set forth in the claims.

The invention affords many advantages, of which the following can be mentioned by way of example.
30

A swing damper that includes an inventive arrangement is very compact.

A smooth braking action is obtained, together with uniform wear
35 on the brake components.

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Floating suspension of the brake unit affords a large number of advantages.

- 5 The useful life of the brake components is significantly extended and the occasions when adjustments may be needed are widely spaced.

10 Brake components can be replaced without needing to remove the tool from the jib tip.

The brake can be readily set initially to a desired braking force, and any subsequent adjustment to the brake arrangement that may be required can also be effected very simply.

15 The brake disc is not subjected to stress or strain as a result of play in the bearing or bearings for instance, and the brake components and associated fastener devices float together with all lateral motion of the brake disc.

20 Inventive arrangements can be used in both single and double swing dampers, and the inventive arrangement can also be readily adapted to two or more brake discs that are disposed parallel with one another.

25 The inventive arrangement has both technical and economical advantages.

30 The invention will now be described in more detail with reference to exemplifying embodiments thereof and also with reference to the accompanying drawings, in which

Figure 1 is a perspective view of an inventive arrangement mounted at the tip of a crane jib and carrying a gripping tool; Figure 2 is a partially cut-away perspective view of a swing damper that includes an inventive arrangement;

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Figure 3 is a perspective view of a brake disc and associated brake unit;

Figure 4 is a vertical section view of the arrangement; and

Figure 5 illustrates an embodiment that includes twin brake discs.

Figure 1 illustrates an inventive swing damper 1 which is pivotally mounted on the tip of a crane jib or arm 2 by means of a slew joint/bearing 3. The swing damper 1 carries at its lower end a rotator 4 which, in turn, carries a working tool, in the illustrated case a gripper 5.

The bearing 3 permits free pendulum movement/oscillatory movement about an axis 6, and the rotator 4 enables the gripping tool 5 to be rotated, the rotator 4 of the illustrated embodiment being hydraulically operated. Hydraulic hoses to the rotator and the gripping tool have not been shown for reasons of clarity.

As will be best seen from Figure 2 and 4, the swing damper 1 includes an upper part 11 which is connected to the jib 2 by means of the bearing 3 for free pivotal movement. The swing damper 1 further includes a bottom part 12 which carries the tool 5, for instance via the rotator 4. The upper part 11 has an attachment lug 15 which co-acts with the bearing 3. The bottom part 12 of the illustrated embodiment carries an attachment means 16 for the rotator 4. Alternatively, the tool 5 may be connected directly to the attachment 16.

The top 11 and the bottom 12 of the swing damper are pivotally interconnected via a slew joint/bearing 13, so as to pivot or swing about an axis 14. The pivot axis 14 is essentially perpendicular to the pivot axis 6. This ensures that the tool 5 will have the desired mobility.

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In order to achieve relatively rapid damping of the pendulum movement/oscillatory movement that occurs when maneuvering the tool 5 suspended from the crane jib, the swing damper 1 is provided with a brake arrangement 50 which functions to brake/retard pendular movement/oscillatory movement of the tool about the pivot axis 14.

The brake arrangement 50 includes a brake disc 60 and a brake unit 70. The bottom edge 61 of the brake disc 60 rests on an upper surface 17 of the bottom part 12 of the damper, and the brake disc 60 is arranged laterally slidable on the center pin 18 of the bearing 13, as will be apparent from Figures 2 and 4. The top part 11 has provided therein a recess 19 which accommodates the brake disc 60, said recess 19 having a width which will allow the brake disc 60 to move sideways to a limited extent, as will best be seen from Figure 4.

The design of the brake disc 60 will best be seen from Figure 3, which shows the disc to have a planar undersurface 61, a circular upper surface 62 and a central hole 63 through which the bearing pin 18 extends with a given clearance. The brake disc 60 also includes a circular or arcuate slot 64 through which a fastener element 71 on the brake unit 70 extends. The fastener element 71 has a certain degree of freedom in the slot 64, so that it is able to move along the slot 64.

In addition to the fastener element 71, the brake unit 70 also includes two brake components in the form of brake blocks 72, and spring devices in the form of so-called cup springs 73.

The fastener element 71 comprises a screw 74 that carries adjacent its head a washer 75 that has a guide collar 76. The screw 71 carries on its threaded end a nut 77 that has a guide collar 78. The nut 77 will suitably be locked against loosening.

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5 The brake blocks 72 have a central hole 79 through which the screw 71 can move freely. The outer contours 80 of the brake blocks 72 are suitably adapted so that they will slide in a hole 20 through the upper part 11 of the swing damper while essentially being shape-guided. The brake components/brake blocks 72 may have a round or non-round outer shape.

10 In the illustrated case, the spring devices 73 are cup springs that are placed on respective sides of the brake blocks 72 and disposed in mirror image with each other, as will be apparent from Figure 4. When a greater spring force is desired, the cup springs 73 can be grouped in a manner different to that shown. The spring devices 73 are guided freely against the guide collars 76 and 78 and are dimensioned so as to have room in the hole 20 and therewith press the brake components 72 against the brake disc 60. The desired braking characteristic/braking force is conveniently set by tightening the nut 77. Any subsequent adjustment required can be achieved by either tightening or loosening the nut 77.

20

The inventive arrangement operates as follows:

25 It is assumed that the brake unit 70 has been adjusted to obtain desired braking properties. The tool 5 will swing when maneuvering the crane jib 2, wherewith swinging movement of the tool 5 will be dampened or braked by the brake components 72 being pressed into braking abutment with the brake disc 60, wherewith the fastener device 71 slides in the arcuate slot 64 in the brake disc 60 in conjunction with braking said movement.

30

It will be noted that the brake disc 60 is not subjected to strain emanating from bearing play for instance. The brake unit 70 floats laterally and adapts itself to the brake disc 60.

Figure 5 shows an alternative embodiment of the invention that includes two brake discs 90 and 91. The brake discs 90,91 are designed according to the same principles as the aforescribed brake disc 60. In the Figure 5 embodiment, the brake unit 70' includes three brake components 72'. In other respects, the construction of the brake unit 70' will be apparent from Figure 5 in which components that find correspondence in the earlier embodiment have been identified by the same reference numerals to which a prime has been added.

It will be understood that the described embodiments can be varied in many ways within the scope of the present invention. For instance, more than one brake unit can be included when necessary. The number of brake discs and brake components can, of course, be varied, as well as the construction of the spring devices 73. The spring devices 73 need not necessarily be divided into two groups in the illustrated manner, but may alternatively be placed at one end of the fastener element 71 if desired.

It will also be understood that the design and construction of the spring devices 73 can be varied widely, and that the spring device may be comprised of many different types of bodies or elements that exert a spring force.

The spring device 73 need not necessarily be a mechanical device, but may comprise a pressure-medium based spring means/pressure means. For instance, hydraulically powered spring means/pressure means may be used. Thus, there are many variations that can be appropriated within the scope of the invention with respect to the design and construction of the spring devices/pressure devices.

In the illustrated case, the brake disc 60 is carried by the lower part 12 and the brake unit 70 by the upper part 11 of the

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swing damper. It will be understood, however, that the inventive arrangement may be constructed so that the brake disc is carried by the upper part 11 and the brake unit carried by the lower part 12 of said damper.

5

The illustrated swing damper is a single-type damper, although it will be understood that inventive arrangements can be used in double-type swing dampers, in which pendular damping/swing damping can be achieved by means of inventive arrangements with respect to both the bearing 3 and the bearing 13.

10

It will also be understood that the described and illustrated components of the swing damper can be replaced with functionally equivalent components within the concept of the invention. Naturally, these optional variations also apply to the choice of material from which said components are made.

15

Thus, the invention is not restricted to the illustrated and described embodiments, since changes and modifications can be made within the scope of the accompanying claims.

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CLAIMS

1. An arrangement relating to a swing damper, particularly to a swing damper (1) for carrying a tool (5) that hangs from a crane jib (2) or the like, wherein the swing damper (1) includes an upper part (11) which is connected to the crane jib (2), and a lower part (12) which carries a work tool (5) or some like device either directly or via a rotator (4) for instance, wherein the upper part (11) and the lower part (12) are pivotally connected to one another through the medium of a slewing joint (13), wherein the swing damper (1) includes a brake arrangement (50) that comprises at least one brake disc (60) and at least one brake unit (70) that coacts with said brake disc, wherein the brake disc (60) is carried either by the upper part (11) or the lower part (12) of said swing damper, and wherein the brake unit (70) is carried by that part that does not carry the brake disc, **characterized in** that the brake disc (60) includes a slot (64) that accommodates a brake unit fastener device (71); in that the brake unit (70) includes at least two brake components (72) each of which is placed on a respective side of the brake disc (60); and in that the brake components (72) are pressed into braking abutment with the brake disc (60) by means of spring devices (73) or by means of a pressure medium, said spring devices or pressure medium being adapted to act between the fastener device (71) and the brake components (72).

2. An arrangement according to Claim 1, **characterized in** that the slot (64) has an arcuate curvature.

3. An arrangement according to Claim 1 or 2, **characterized in** that the fastener device (71) includes a screw (74) and a nut (77).

4. An arrangement according to any one of Claims 1-3, **characterized in** that the outer contour of the brake components

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(72) is adapted for sliding coaction with a recess (20) in the part (11) that lacks a brake disc.

5. An arrangement according to any one of Claims 1-4, **characterized in** that the spring device (73) comprises cup springs.

6. An arrangement according to any one of Claims 1-5, **characterized in** that the part (11) that does not carry a brake disc has a recess (19) which accommodates a part of the brake disc (60).

7. A method relating to a swing damper, particularly to a swing damper (1) which is intended to carry a tool (5) that hangs from a crane jib (2) or the like, wherein the swing damper (1) includes an upper part (11) that is connected to the crane jib (2), and a lower part (12) that carries a working tool (5) or the like either directly or via a rotator (4) for instance, wherein the upper part (11) and the lower part (12) are pivotally connected to each other via a slewing joint (13), wherein the swing damper (1) includes a brake arrangement (50) that comprises at least one brake disc (60) and at least one brake unit (70) that coacts with said brake disc, wherein the brake disc (60) is carried either by the upper part (11) or the lower part (12) of said swing damper, and wherein the brake unit (70) is carried by the part that does not carry the brake disc, **characterized by** generating a braking action so as to dampen swinging of said tool with the aid of two brake components (72) included in the brake unit (70), said brake components being caused to be pressed into braking abutment with the brake disc (60) by means of spring devices or by means of a pressure medium adapted to act between a brake unit fastener device (71) and the brake components (72), said fastener device (71) sliding in an arcuate slot in the brake disc during pendulum movement/swinging movement.

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8. A method according to Claim 7, **characterized by** causing a peripheral surface of the brake components (72) to coact slidingly with a recess (20) in the part (11) that does not carry the brake disc.

9. A method according to Claim 7 or 8, **characterized by** using mechanical spring devices (73).

10. A method according to Claim 7 or 8, **characterized by** using hydraulically powered spring means.

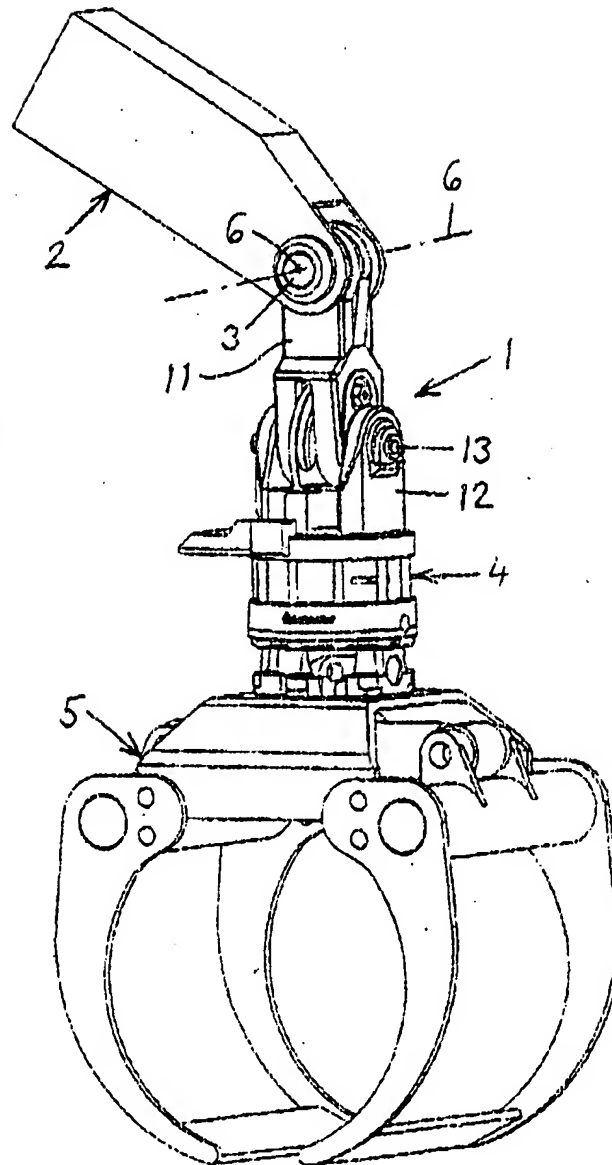
11. The use of an arrangement according to any one of Claims 1-6, **characterized in** that the arrangement is used to dampen pendular movement/swinging movement of a suspended object (5).

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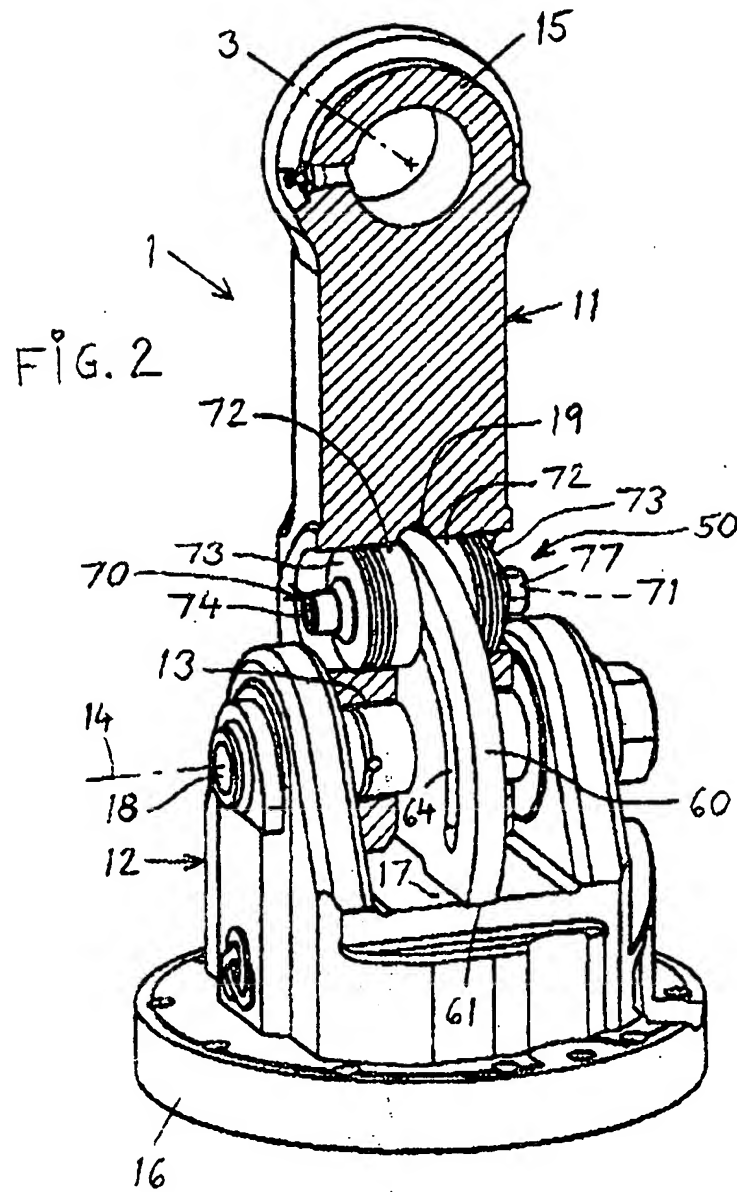
FIG. 1



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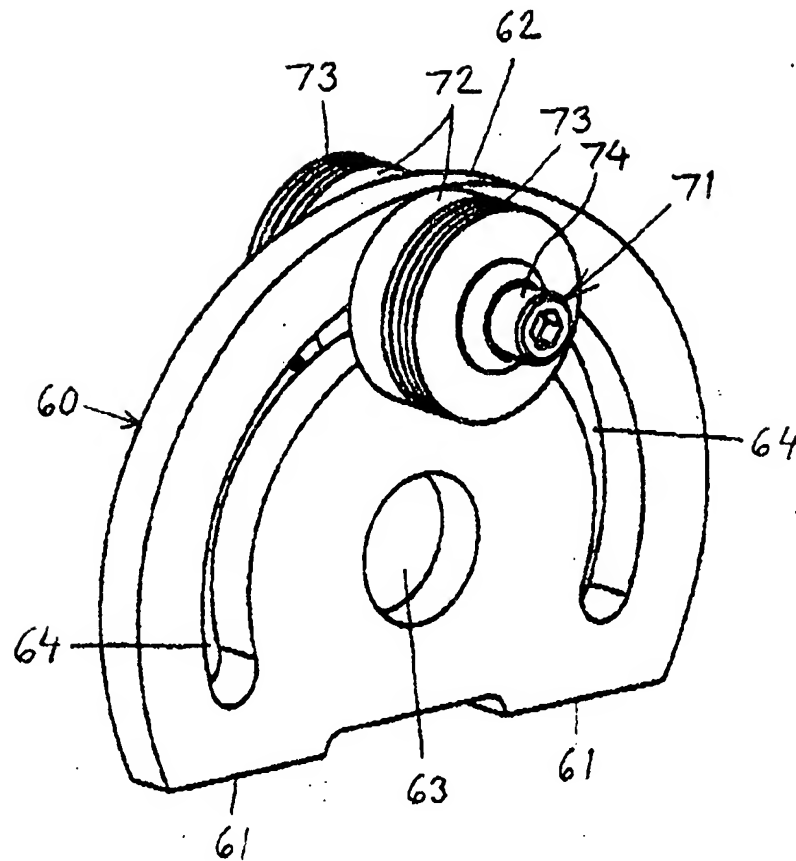


FIG. 3

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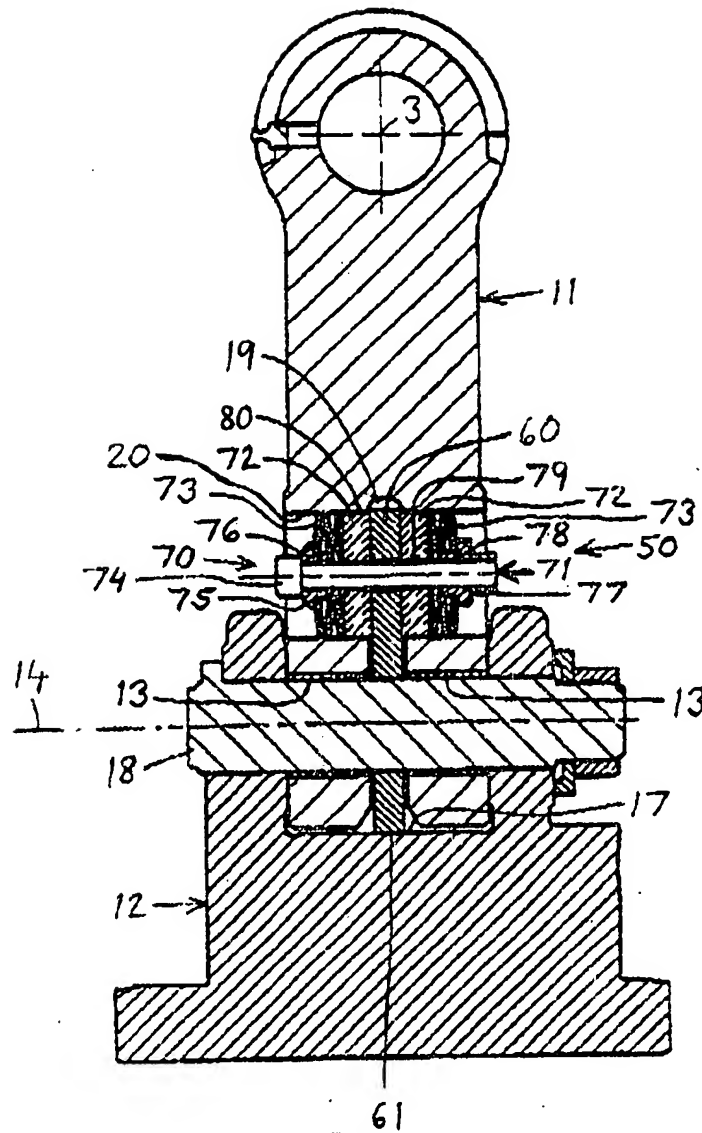


FIG. 4

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/00466

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B66C 3/00, B66C 13/06 // F16F 7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B66C, F16F, E02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3937302 A (PALMCRANTZ), 10 February 1976 (10.02.76), column 2, line 45 - column 3, line 13; column 4, line 7 - line 10, figures 1-3	1-11
Y	US 4417759 A (PIERROT, III ET AL), 29 November 1983 (29.11.83), column 2, line 40 - line 59, figure 2	1-11
A	US 3895694 A (MUNTJANOFF), 22 July 1975 (22.07.75), figures 1-7, abstract	1,7

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

26 June 2000

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT
 Information on patent family members

02/12/99

International application No.

PCT/SE 00/00466

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3937302 A	10/02/76	AT 348197 B	12/02/79
		AT 1013974 A	15/06/78
		DK 140932 B,C	10/12/79
		DK 667474 A	18/08/75
		FI 52836 B,C	31/08/77
		FI 362874 A	20/06/75
		SE 378594 B,C	08/09/75
		SE 7317130 A	23/06/75
US 4417759 A	29/11/83	BR 8205224 A	16/08/83
		CA 1229108 A	10/11/87
		FI 71714 B,C	31/10/86
		FI 823044 A	09/03/83
		SE 8205057 A	06/09/82
US 3895694 A	22/07/75	CA 1024474 A	17/01/78
		SE 405841 B,C	08/01/79
		SE 7506395 A	12/01/76

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